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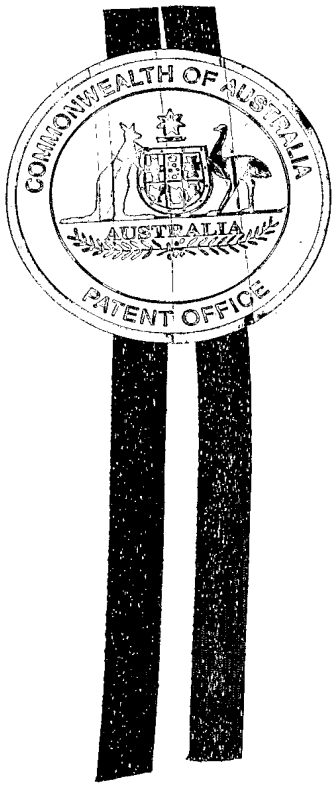

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Eighth day of March 2005

LEANNE MYNOTT
MANAGER EXAMINATION SUPPORT
AND SALES

AUSTRALIA
Patents Act 1990

P/00/009
Regulation 3.2

Revised 2/98

Provisional Specification

Invention Title

Extended Arc Up-and-over Screen Assembly

The invention is described in the following statement

(See within)

THIS INVENTION relates to an up-and-over screen assembly, and is more specifically, although not exclusively concerned with such an assembly having a screen that can be moved from a first position at which it stands vertically alongside the lower portion of an upright guide, and an elevated position at which the screen extends transversely from the guide to protect an area beneath the screen from chosen ambient conditions such as rain or direct sunlight. The screen is moved between its two positions by movement of a traveller along an upright track provided on the guide. The screen is guided during its movement between its two operating positions by one or more rigid links. The upper end of each link is pivoted at a location fixed with reference to the upper end of the guide so as to turn about a horizontal first common axis, and the link slopes downwards to a second location at which it is attached to the screen to turn about a second pivotal axis which is parallel to the first pivotal axis. One example of such an up-and-over screen assembly is described in detail and illustrated in the specification of my co-pending international published patent application No. WO 03/040490 A1 hereby inserted by way

The advantage of an up-and-over screen is that the area that is shielded from above by the screen, is not physically traversed during movement of the screen between its two positions. Thus if, for example, the screen is being used to protect a car port, the car does not have to be moved out of the car port before the screen can be moved.

There are circumstances in which the screen is required to intercept sunlight during extended periods when the sun is following its arc of movement across the sky. When the sun is approaching the two ends of its movement, protection from its rays requires the screen to occupy two mutually-transverse planes, respectively, both of which are inclined with respect to the vertical axis of the guide and the first of which slopes upwardly from the guide while the second plane slopes downwardly from the guide. For the screen to occupy one of these planes, the traveller is located beneath the second common axis. As long as the traveller is located in this position, the stiffness of a frame, normally used to support the screen, provides a downwardly inclined strut extending between the screen and the traveller. This strut resists the turning moment of the weight of the screen about

the upper end of the guide and which urges the screen towards the guide. The screen position can thus be accurately controlled by the position of the traveller.

However, if the screen is to occupy the second of these planes, the stiffness of the screen no longer provides an effective strut opposing the turning moment referred to above and, as a result, an element of instability occurs in the ability of the traveller to position the screen correctly. For this reason the up-and-over screens currently available are designed to move the screen through ninety degrees from the lowered vertical position to the raised horizontal position. They are not designed to move the screen through an angle greater than this ninety degrees and for this reason the advantage of having a screen moveable between the two mutually-inclined planes referred to above, is lost.

An object of this invention is to provide an improved up-and-over screen.

In accordance with the present invention an up-and-over screen assembly has an upright guide or mast providing a track for a traveller used to raise and lower a screen, fixed at one side to the traveller, through more than ninety degrees from a lowered vertical position to a raised position at which the screen shields a chosen ground area adjacent the guide from a particular ambient condition, the screen being guided in its movement by one or more rigid links which rotate at their ends about parallel horizontal first and second axes, the first of which is fixed in relation to the upper end of the guide and the second of which is fixed in relation to the screen, a device being provided to resist uncontrolled upward movement of the traveller when the screen is raised through ninety degrees or more.

In one arrangement the device provides a resilient bias that is controllable. Preferably the bias progressively increases with the upward movement of the traveller beyond the level of the second common axis. This may be achieved by having the device positioned above the traveller and using a coiled compression spring located between two discs in a cylinder to generate a resilient bias. One of the discs may be fixed in position along the axis of the cylinder but having such position controlled by an adjustable fitting manually

accessible from outside the cylinder to determine the magnitude of the bias and the way it changes. The other disc is conveniently positioned to be engaged by the traveller when it moves upwards past the level of the second common axis.

In a second arrangement the device is located beneath the traveller and is connected to it by a flexible inextensible element hanging down from the underside of the traveller. The device may again use a coiled compression spring located between two discs one of which is fixed and the other of which is movable. A length-varying component may be incorporated into the element and which may be adjusted during setting-up of the assembly to ensure the spring exhibits the required bias as it is compressed.

In a third arrangement the device comprises a high speed-reduction gear box disposed between a drive unit which controls the position of the traveller on the guide or mast, and an inextensible drive loop connecting the traveller to the output side of the gear box. The ratio of the gearbox is sufficiently large to prevent the load on the drive loop reversing the drive direction through it back to the drive unit. Thus at all times the position of the traveller is positively determined by the drive unit.

In a fourth arrangement the device takes the form of a vertical lead-screw inside the mast or guide to which the traveller is connected so that rotation of the lead-screw about its vertical axis produces vertical movement of the traveller. The pitch of the lead-screw thread is such that although it will transmit drive from the lead-screw to the traveller, it will not transmit drive in the reverse direction. Thus controlled operation of a drive unit used to rotate the lead-screw produces a desired vertical movement of the traveller without the risk of instability occurring when the traveller is raised to a position at which the screen starts to slope upwards towards the mast.

In a fifth arrangement of the invention, a gas strut is fitted inside the upper end-portion of the mast or guide. The gas strut basically comprises a piston and cylinder unit in which the space inside the cylinder is filled with gas under pressure. Such a strut is commonly used in gas lift chairs and car tail gates to support the tail gate when being lifted so that

the force required to lift it is reduced. The length and pressure of the gas strut is so chosen that it does not impede lifting of the screen to a position at which the traveller is at about the same level as the second pivotal axis. However lifting of the screen beyond this position results in the traveller engaging the lower end of the piston of the gas strut to try and force it back into the cylinder. This introduces a resistance to uncontrolled upward movement of the traveller, so that controlled lifting of the traveller can continue to take place as the force resisting such lifting is still present although it is no longer produced by the weight of the screen.

The invention will now be described in more detail, by way of examples, with reference to the accompanying largely diagrammatic and informal drawings, in which:-

FIGURE 1 is a sketch of an up-and-over screen assembly having a guide in the form of an upright mast supporting a screen on one side and shown in four different positions referenced A,B,C and D;

FIGURE 2 shows two screen assemblies of the type shown in figure 1 and arranged back-to-back to provide shade for an extended ground area beneath, despite movement of the sun to different positions during the day;

FIGURES 3 and 4 are respectively side and cross-sectional views of a device located at the top of the mast to counteract a turning moment that would otherwise introduce an instability into the operation of the assembly after the screen has been raised through a horizontal position;

FIGURES 5 and 6 show another form of device to that shown in figures 3 and 4 and for locating at the foot of the mast, the device being shown in vertical section and cross-section, respectively;

FIGURES 7 and 8 show in face and side views, respectively, a screen assembly usable to protect a ground area of extended length from overhead ambient conditions; and,

FIGURE 9 shows by way of a broken-away diagram of a support mast for an up-and-over screen assembly, the use of an endless chain loop and high ratio gear box to control the position of the screen without instability occurring when the screen is lifted and turned through ninety degrees or more from a lowered vertical position to an overhead shielding position at which it slopes down from its traveller.

The assembly shown in figure 1 comprises a mast 1 providing a vertical track for a traveller 2 movable up and down the mast to vary the position of a screen 3 that is provided on one side of the mast 1. The screen is connected by an articulated joint to the traveller and is shown in full outline in the horizontal position "C" at which it is located above head height and shields an area of the ground alongside the foot of the mast from ambient conditions such as rain or sunlight. The screen is shown in the figure in various different positions. For example, when in its fully lowered position "A" it stands vertically alongside the mast as is indicated by the dotted outline of the screen. When partially raised, so that it slopes upwardly from the mast, it occupies a position "B" shown in pick-and-dot outline. Finally, when the traveller has moved above the position at which the screen is horizontal, the screen slopes downwardly from the mast 1 as is shown in broken outline "D". The screen 3 is guided during the upward movement of the traveller 2, by a stiff link 4 sloping down from an upper part of the mast 1 and having its ends movable about respective horizontal and parallel axes one of which is attached to the mast close to its upper end as indicated by the reference 5, and the other axis is provided by a pivotal connection 6 attaching the lower end of the link 4 to an intermediate position on the upper surface of the screen 3.

Movement of the traveller 2 up and down the mast 1 is achieved by a cable (not shown) having its lower end attached to the traveller 2 and its upper end attached to an electrically-operated winch (also not shown) located at the top of the mast. A manually-operated winch at the lower end of the mast is also usable. In this case a pulley at the top of the mast has a cable passing over it and which is connected at one end to the winch and at the other end to the traveller 2. Movement of the pivotal connection 6 from the

position referenced 7 at which the screen is depicted in dotted outline, to the position 8 which is shown in pick-and-dot outline, is accompanied by stable movement of the screen 3 because the turning moment created by the weight of the screen 3 is opposed by the stiff portion of the screen frame extending between the pivotal connection 6 to the traveller and which acts as a strut in compression to oppose the turning moment effectively.

However when the traveller 2 is raised above the position at when the screen 3 is horizontal (shown in full outline) to the position referenced "D", the compressive force on the stiff portion of the screen frame is greatly lessened. The higher the traveller is raised, the more this effect is experienced and, as a consequence, there is a progressively changing increase in load on the cable. This causes the precise positioning of the screen to become unstable with the result that the screen cannot be positioned exactly where required. Indeed, the reduction in the force opposing the turning moment referred to above, can cause the screen to collapse uncontrollably against the mast should the traveller be raised to too high a level.

In order to prevent this instability occurring when the traveller 2 is raised above the position at which the screen is horizontal, a device 10 is provided at the top of the mast. This device is shown in detail in figures 3 and 4 to which reference is now made.

Figures 3 and 4 shows a portion of the top of the mast 1. The traveller 2 is provided with a bar 11 connected inside the mast to a carriage 15. The carriage allows the traveller 2 to be raised and lowered smoothly on the mast and provides an anchorage for the lower end of the cable that extends upwardly to the winch (not shown) at the top of the mast 1. The track on the mast is provided by a vertical slot 12 through which the bar 11 extends, and an articulated joint 14 connecting the traveller 2 to the centre of one side of the screen frame as shown in figure 4.

The device 10 comprises an upright cylindrical steel casing 16 having a vertical blind slot 17 extending upwardly from its underside in alignment with the track slot 12. The casing

16 is coaxially arranged on the mast 1 and a coiled compression spring 18 is arranged between them. A vertically-movable, annular, bearing ring 20 is engaged by the top end of the spring 18 which rests on a second annular bearing ring 21 vertically upwardly movable inside the casing 16 from a set of stops (not shown). A set of adjustment screws 23 pass through respective threaded openings in a top plate 24 closing the upper end of the casing 16. The screws 23 allow the bias exerted by the spring 18 to be varied, as required, by vertically moving the ring 20. The downward movement of the ring 20 achieved by altering the screws 23, varies the compression of the spring 18 when its lower end is against the stops mentioned above.

The device 10 is so positioned on the mast 1 that the bar 11 abuts the lowermost convolution of the spring 18 when the screen 3 assumes the full outline, horizontal position "C" shown in figure 1. Lifting of the traveller bar 11 beyond this position results in the bias now exerted by the spring 18 countering the tendency of the traveller 2 to rise up the track in an uncontrollable manner. As the resistance to the turning moment exerted on the mast by the screen diminishes, the resilient bias provided by the compression of the spring 18 increases, and stability of the movement of the traveller 2 is thus maintained. The compression of the spring 18 to achieve this balance is determined by controlling the adjustment screws 23 during setting up of the assembly.

Instead of placing the device at the top of the mast as shown at 10 in figure 1, a similar effect may also be obtained by placing another form of device at the foot of the mast as shown at 30 in figure 1. The construction and operation of this form of device will now be explained with reference to figures 5 and 6.

The device 30 comprises a cylindrical cup 31 securely anchored to the ground and which receives the lower end of a cylindrical holder 32 having a stepped bore so that its lower cylindrical part 33 is a close sliding fit in the cup 31. The lower part 33 is of larger diameter than the cylindrical upper part 34 and is co-axial with it. The upper part 34 is a snug fit in the interior of the lower end of a cylindrical pole providing the mast 1. A ring

of bolts 35 securely attaches the lower end of the mast 1 to the upper part 34 of the holder 32.

The mast 1 has a longitudinal slot providing an upright track for a traveller 2 that controls the vertical position of the screen 3 on the pole 1 as in the example described above. The traveller is provided by a carriage 15 (see figure 4) inside the mast 1 and from which a bar 11 extends through the slot (see figure 4) to an articulated connection 14 attaching the bar 11 to the centre of one side of the screen 3 (see figure 1). An inextensible flexible connector such as Reynolds chain 36 extends down through the mast 1 from the underside of the carriage 15. The chain is fully extended when the position of the carriage 15 corresponds to the screen being horizontal. The lower end of the chain 36 is attached to an upright lug 37 extending upwardly from the centre of a piston disc 38 located at the bottom of the lower part 33 and vertically slidable within it in response to the tension in the chain 36.

A steel partition 40 having a central opening for the lug 37, extends across the interior of the holder 32 and divides the interior of the lower part 33 into upper and lower cylindrical chambers 41 and 42. The upper chamber 41 provides a space for storing surplus chain 36 when the traveller 7 is beneath its position at which the screen 3 is horizontal. The lower chamber 42 contains a coiled compression spring 43 positioned between the underside of the partition 40 and the piston disc 38. The chain 36 contains an adjuster component (not shown) such as a bottle screw, allowing its effective length to be altered during setting up of the screen assembly 1.

With the arrangement of the assembly shown in figures 1, 5 and 6, the device 30 allows the mast 1 to be rotated bodily about its vertical axis so that the screens can be moved to different positions around the mast. The traveller 2 can be raised by the winch on top of the mast 1, to a position at which the screen 3 has moved through the horizontal position "C" in figure 1 and begins sloping downwards away from the mast 1 as shown in position "D". This movement occurs without loss of control, as the increased resistance to upward movement of the traveller 2 and created by the compression of the spring 38, prevents an

unstable condition occurring as a result of the reduction in the force opposing the turning moment produced by the weight of the screen 3.

Figure 2 shows how two screen assemblies of the construction described with reference to figure 1 can have their masts 1 arranged back-to-back to allow the arc of protection given by the two screens 3(a) and 3(b) to cope with movement of the sun through its arc of travel as the day progresses, from position 70 to position 71. Such an arrangement can also be designed so that the two masts 1 are combined into a single mast having separately operable screens 3(a) and 3(b) arranged one on each side of the mast. Parallel vertical channels or ducts (not shown) are used in the mast to accommodate the various moving parts of the assemblies which are required to move independently of one another.

Figures 7 and 8 shows an arrangement in which several upright guides or masts 60 are arranged at spaced intervals and together support an elongated screen 61 of extended length. Each mast in the line is arranged to have its winch 62 controlled in synchronism with the winches of the other masts by means of a common drive spindle 63 arranged horizontally and driven by a motor 64 disposed at one end of the spindle. Rigid links 4 at intervals along the length of the screen 61 guide its movement, so that it moves as a single unit up and down the masts 60 by the synchronously operated winches 62. Each mast is provided with a device 10 of the type shown in figures 3 and 4 for allowing its traveller 2 to be raised above the position at which the screen is horizontal, without loss of control of its movement after the screen has been through an angle of ninety degrees or more.

Figures 7 and 8 show the masts 60 arranged as respective rails set into a support wall 66. They may also be free standing. In both figures the vertical position of the screen 61 when lowered, is shown in dotted outline.

Figure 9 shows an upright mast 80 having a vertical guide slot (not shown) through which extends a traveller bar 81. An aperture 83 extends horizontally through the bar 81 and receives a pin (not shown) for holding in place a clevis 84 pivoted to the bar 81 to the

bar. The clevis is attached to the centre of one side of a frame 85 that supports the up-and-over screen 86. The central portion of the screen is also supported by downwardly-sloping rigid links (not shown) pivoted at their ends to turn about two parallel horizontal pivotal axes. The upper axis connects the links to a fixed position on the upper end of the mast 80 and the lower axis connects the links to an intermediate portion of the screen as has been already been described with reference to earlier figures.

The mast 80 is provided internally with an upper sprocket wheel 87 and a lower sprocket wheel 88. An inextensible loop formed by a Reynolds chain 89 or an equivalent inextensible positive drive transmission loop which may, for example, be of the type used to provide a timing belt or chain, extends around both sprocket wheels and its ends are attached to the traveller 81 to control its vertical position on the mast 80.

The upper sprocket wheel 87 is driven by an output shaft 90 of a high ratio gear box 91. The gear box 91 has an input drive shaft 92 that is driven by an electric motor 93. The ratio of the gear box 91 is large enough to allow drive to be transmitted through it from the motor 93 to the sprocket wheel 87 while preventing drive from being transmitted in the reverse direction. Thus the vertical position of the traveller 81 is precisely controlled at all times by the motor 93 and is always independent of changes in the tension of the chain 89 caused by the changes in inclination of the screen when it passes through the horizontal position.

It will be understood that the screen of the assembly is supported by a single mast, the traveller will be connected to the centre of a frame supporting the screen at one side. However when a screen is supported by two or more masts, the travellers of respective masts will be located at positions on the sides of the screen frame which are other than at the centre of the side adjacent the mast.

In all of the arrangements where a single mast is used, there are substantial advantages in shielding to be obtained by using two independently operable screens arranged respectively on opposite sides of the mast. As previously mentioned these screens can be

tilted to ensure maximum protection from ambient overhead conditions. Also by using an arrangement which allows bodily rotation of the mast about its vertical axis or the screens to be rotated about the axis of the mast if the mast is not itself bodily rotatable, the overhead shielding provided by the screens can be arranged to move to accommodate the change in the position of the sun as it follows its arc across the sky during the day. Where a large area of protection is required, several pairs of screens each associated with its own mast can be arranged so that they move in parallel and in unison to provide the maximum protection during the day.

From the above description it will be understood that I claim my invention to reside in one or more of the integers set forth in the following numbered paragraphs:

1. An up-and-over screen assembly having an upright guide providing a track for a traveller used to raise and lower a screen fixed at one side to the traveller, through more than ninety degrees from a lowered vertical position to a raised position at which the screen shields a chosen ground area adjacent the guide from a particular ambient condition, the screen being guided in its movement by one or more rigid links which rotate at their ends about parallel horizontal first and second axes the first of which is fixed in relation to the upper end of the guide and the second of which is fixed in relation to the screen, and a device provided to resist uncontrolled upward movement of the traveller when the screen is raised through ninety degrees or more and fixed in position with respect to the guide.

2. An assembly as set forth in the above-numbered paragraph, in which the device provides a controllable resilient bias.

3. An assembly as set forth in paragraph 2, in which the bias progressively increases with upward movement of the traveller beyond the level of the second common axis.

4. An assembly as set forth in any one of the above-numbered paragraphs, in which the device is positioned above the traveller and uses a coiled compression spring located between two discs in a cylinder to generate a resilient bias.

5. An assembly as set forth in paragraph 4 above, in which one of the discs is fixed in position along the axis of the cylinder and has its position controlled by an adjustable fitting manually accessible from outside the cylinder to determine the magnitude of the bias and the way it changes.

6. An assembly as set forth in paragraph 5, in which the other disc is positioned to be engaged by the traveller when it moves upwards past the level of the second common axis.

7. An assembly as set forth in one of the above-numbered paragraphs 1 to 3, in which the device is located beneath the traveller and is connected to it by a flexible inextensible element hanging down from the underside of the traveller.

8. An assembly as set forth in paragraph 7 above, in which the device uses a coiled compression spring located between two discs one of which is fixed and the other of which is movable.

9. An assembly as set forth in paragraph 7 or paragraph 8, in which a length-varying component is incorporated into the element and is adjustable during setting-up of the assembly to provide the required bias.

10. An assembly as set forth in any one of the above-numbered paragraphs 1 to 3, in which the device comprises a high ratio reduction gear box permitting drive through it in one direction only and disposed between a drive unit which controls the position of the traveller on the guide, and an inextensible drive loop connecting the traveller to the output side of the gear box.

11. An assembly as set forth in any one of the above-numbered paragraphs 1 to 3, in which the device is provided by a gas-strut which is compressed progressively by upward movement of the traveller beyond the level of the second pivotal axis.

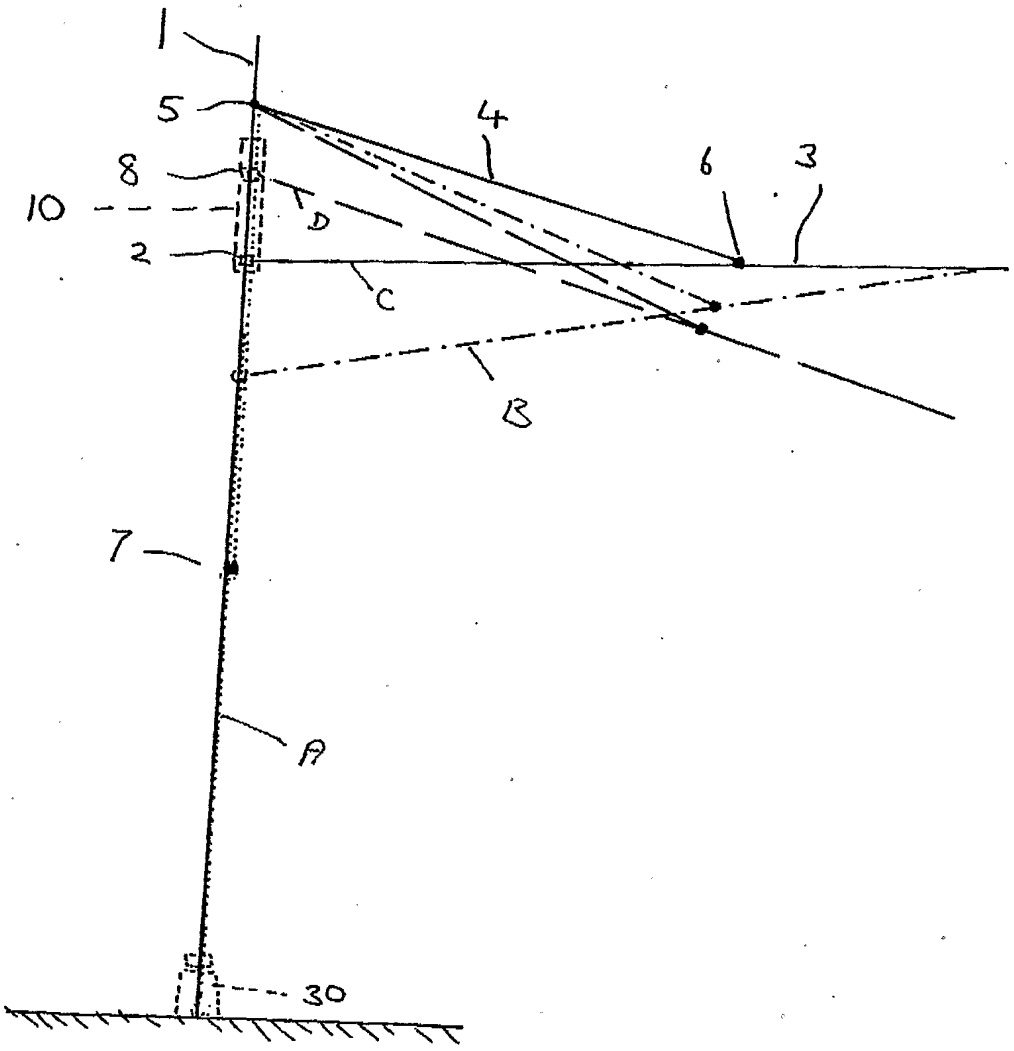
Dated this 26 day of February 2004.

MARK SNYDERS

By: H.J. Rambler
(Applicant's Patent Attorney)

2nd draft 18.2.04

Fig 1



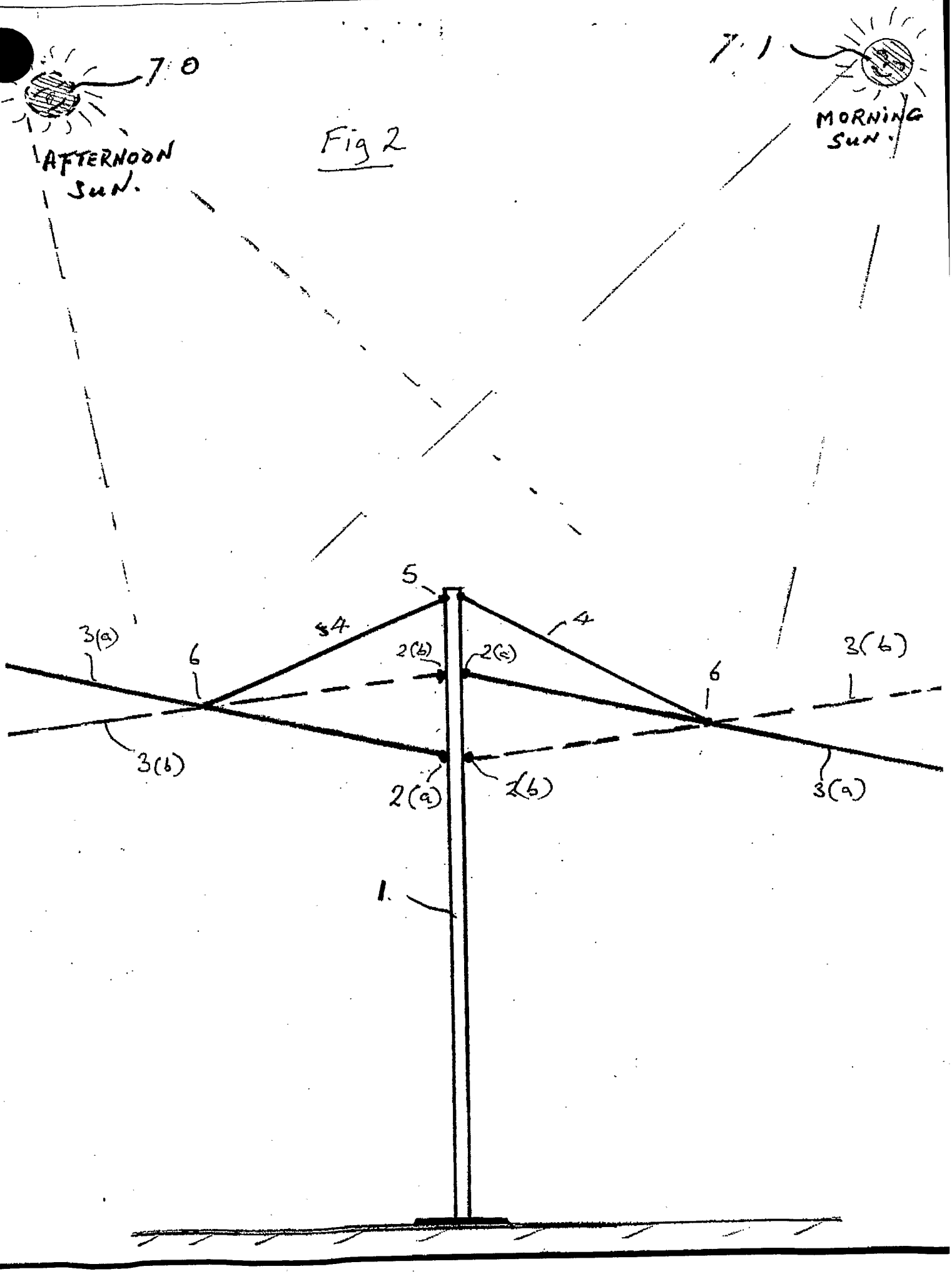


Fig 2

Fig 3

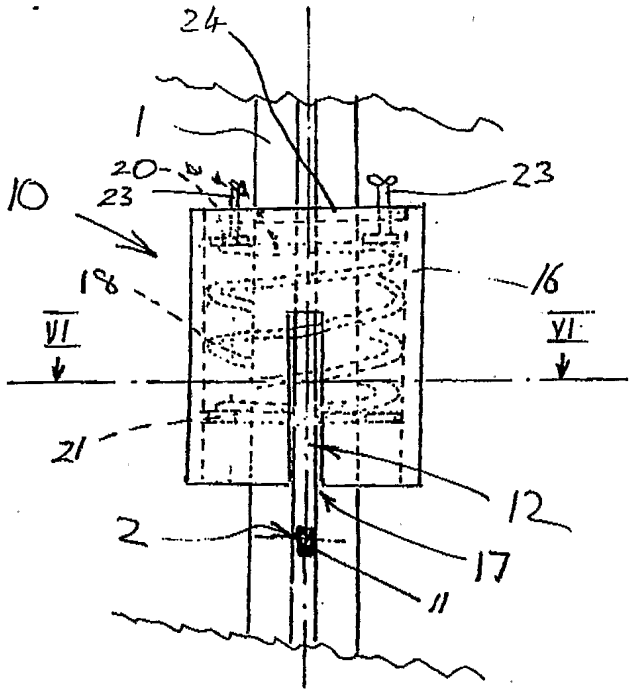


Fig 4

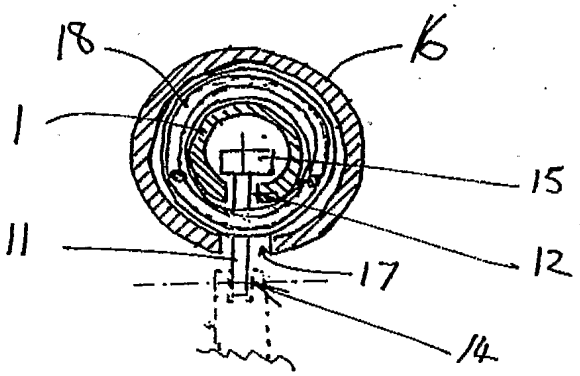


Fig 5

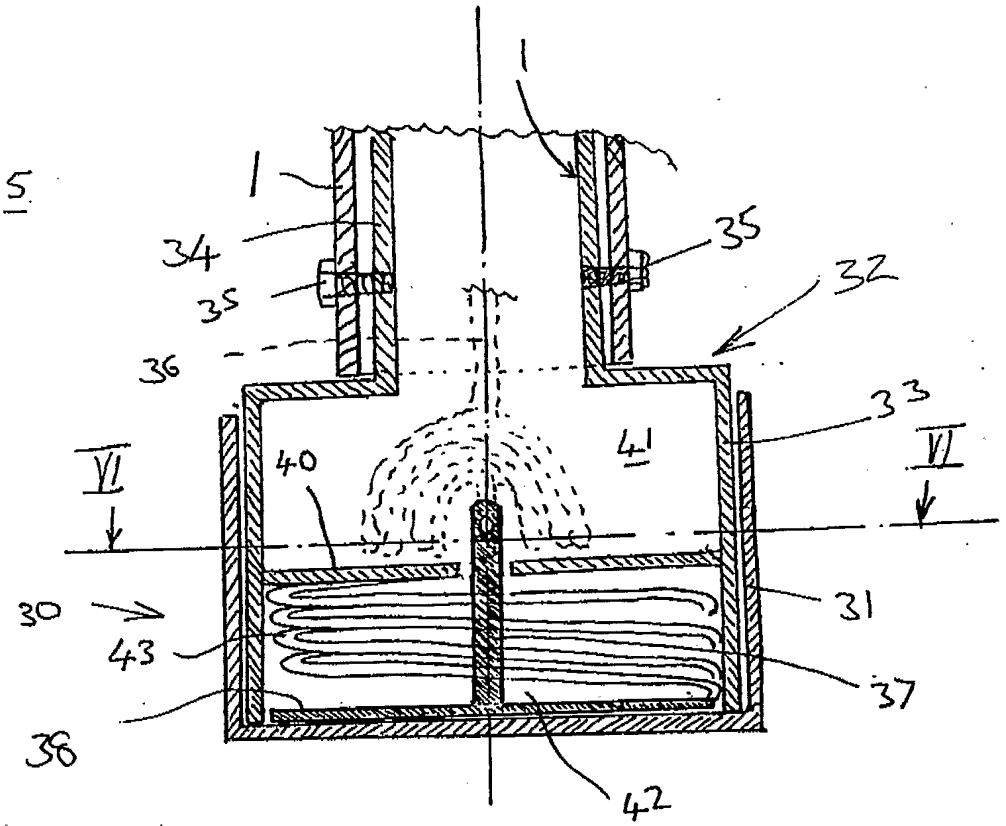


Fig 6

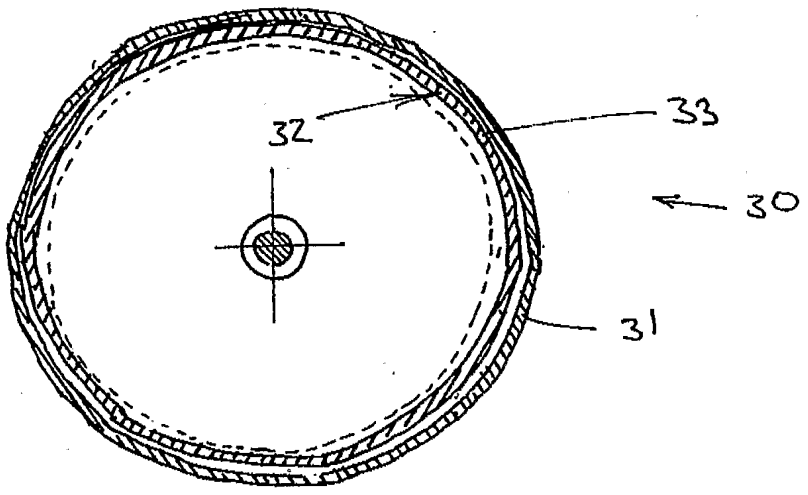


Fig. 7

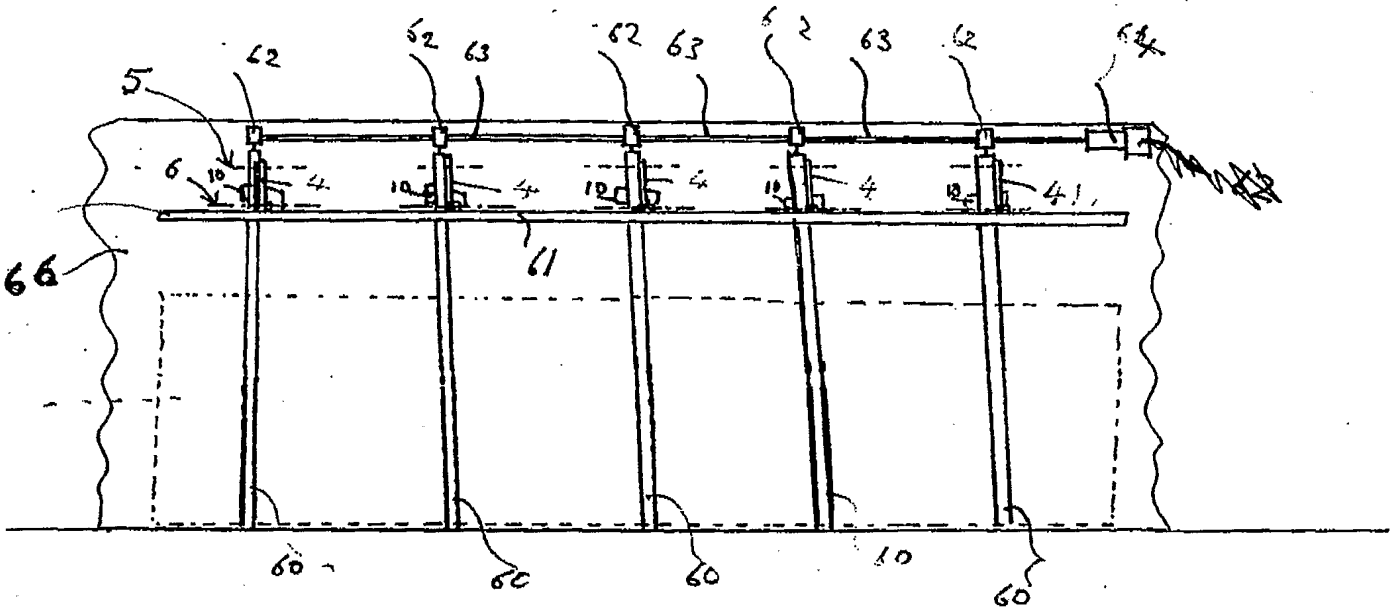


Fig. 8

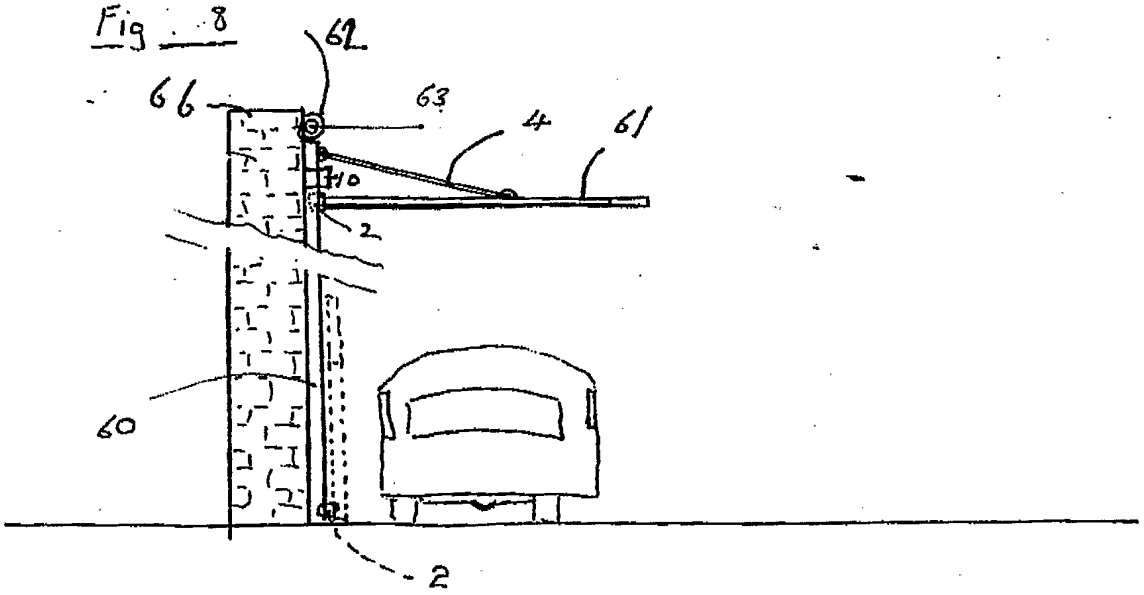


Fig 9